

Mothers' preference and willingness to pay for human papillomavirus vaccination for their daughters: a discrete choice experiment

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KEY MESSAGES

1. Concern about adverse effects is the most important barrier to human papillomavirus (HPV) vaccination.
2. Vaccination strategies should focus on knowledge exchange and education on the safety and benefits versus risk to improve vaccination uptake.
3. Demand for HPV vaccines is high as indicated by the maximum willingness to pay. However, the willingness to pay for current vaccines is lower than the current market price.
4. Subsidy or co-payment from the government should be considered to meet demand for HPV vaccination.

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Introduction

In Hong Kong, cervical cancer is the seventh commonest cancer among females and accounts for about 3.6% of all new cancer cases. To reduce the disease burden, a cervical cancer screening programme was launched in 2004 and two vaccines were introduced in 2006. However, HPV vaccination is not included in the government immunisation schedule and is largely taken up in private clinics opportunistically. The uptake rate of HPV vaccination among adolescent girls in Hong Kong is low (2.1%-9.1%).^{1,2}

The success of a HPV vaccination programme largely depends on the local stakeholders' attitude towards risks and benefits of vaccination. Our study used a discrete choice experiment to elicit Hong Kong mothers' preference and willingness to pay (WTP) for HPV vaccination for their daughters.

Methods

A cross-sectional survey of mothers with daughters aged 8 to 17 years was conducted at the paediatric specialist outpatient clinics of two public hospitals using a stratified sampling approach. A discrete choice experiment was used to elicit the preferences and WTP of mothers.

The survey was delivered through Survey Monkey (Palo Alto, California, USA) using a portable device. Sociodemographic data, health and vaccine experiences, and the discrete choice experiment

responses were recorded. Trained research assistants screened the eligibility of participants, and written consent was obtained. The discrete choice experiment choices were analysed using a multinomial logistic regression model. Regression coefficients (with 95% confidence intervals) and WTP were reported. The marginal WTP for one unit change in each attribute was calculated by equation 1:

$$\text{Marginal WTP} = \frac{\text{Preference Weight}_{\text{attribute}} \times \Delta \text{Level}_{\text{attribute}}}{\text{Preference Weight}_{\text{out-of-pocket cost}}} \quad (1)$$

Total WTP for vaccines was calculated by equation 2:

$$\text{Total WTP} = \text{Marginal WTP}_{\text{protection}} + \text{Marginal WTP}_{\text{protection}} + \text{Marginal WTP}_{\text{side effects}} \quad (2)$$

All statistical analyses were conducted using Statistical Analysis System version 9.3.

Results

A total of 482 mothers (mean age, 42.9 years) were interviewed with a response rate of 79.1% (Table 1). About 58.5% of mothers were born in Hong Kong and about 97.4% had secondary education or above. About 45.5% of mothers had monthly household income more than HK\$30 000. More than 75% of mothers had heard about HPV vaccines and were concerned about their daughters' risk of HPV infection and cervical cancer. However, approximately 55.4% of mothers believed vaccines

are somewhat unsafe or very unsafe and some refused vaccine for their daughter. Approximately 96.7% of mothers reported either sex education or abstinence should be taught at school, which was a proxy for conservative values.

In the validity test of scenario 1, 99.4% of mothers made a reasonable choice with higher protection effectiveness, longer protection duration, and lower probability of adverse effects. In the actual discrete choice experiment of scenarios 2 to 9, 58.3% to 86.3% of mothers chose one of the two vaccines after considering the trade-off among health benefit, risk, and cost in each scenario. Table 2 shows the mothers' preferences estimated from the statistical model. All attributes had a significant impact on the utility ($P < 0.001$). The most important attribute was adverse effects, followed by protection against cervical cancer and protection duration.

The marginal WTP for each attribute and the overall WTP for vaccine are shown in Table 3. Vaccine effectiveness, defined as cervical cancer protection rate, was highly valued with the largest marginal WTP of HK\$5431. Mothers were willing to pay similarly for lifetime protection duration (HK\$3545) and the greatest adverse effect reduction from 14 to 0 in 100 mothers (HK\$3550). Maximum WTP for ideal technology with the best of all features was HK\$12526. The WTP for current vaccines is approximately HK\$1700, which is relatively lower than the current market price (HK\$2100-4000).

Discussion

Cervical cancer is one of the deadliest and yet most preventable cancers. Disease burden of cervical cancer is relatively higher in Hong Kong than other developed areas, as there is no universal screening or vaccination programme in Hong Kong. In Hong Kong, HPV vaccination among teenage girls is largely opportunistic and the uptake rate is low.^{1,2} Understanding the determinants of HPV vaccine uptake is crucial for designing more effective vaccine-promotion programmes and for re-evaluating immunisation policies. In our study, significant determinants of the HPV vaccine uptake were cervical cancer protection effectiveness, protection duration, adverse effects, and out-of-pocket costs.

In contrast to the commonly recognised attribute of protection effectiveness in the US,³ Vietnam,⁴ and Thailand,⁵ Hong Kong mothers weighted adverse effects as a priority when making choices between vaccines. This may be explained by differences in culture, ethnicity, and education levels. For example, our sample appears to be more conservative on sexual health issues (abstinence should be taught in schools: 96.7% vs 21.6%) and less-well educated (tertiary education or above: 27.5% vs 39.7%), compared with US mothers.³ Further, 55.4% of Hong Kong mothers believed

TABLE 1. Characteristics of respondents

Characteristics	Total (n=482)*	Princess Margaret Hospital (n=181)*	Queen Mary Hospital (n=301)*
Mean±standard deviation mother age, y	42.9±5.5	41.4±5.6	43.8±5.2
Place of Birth			
Hong Kong	282 (58.5)	95 (52.5)	187 (62.1)
Mainland China	174 (36.1)	72 (39.8)	102 (33.9)
Others	26 (5.4)	14 (7.7%)	12 (4.0)
Education			
Primary or below	27 (5.6)	15 (8.3)	12 (4.0)
Secondary	322 (66.9)	136 (75.1)	186 (61.8)
Tertiary or above	133 (27.5)	30 (16.6)	103 (34.3)
Monthly household Income			
<HK\$10 000	33 (6.85)	21 (12.5)	12 (4.0)
HK\$10 000-20 000	130 (27.0)	66 (36.5)	64 (21.3)
HK\$20 001-30 000	84 (17.4)	28 (15.5)	56 (18.6)
HK\$30 001-50 000	103 (21.4)	29 (16.2)	74 (24.6)
HK\$50 001-100 000	89 (18.5)	22 (12.2)	67 (26.3)
>HK\$100 000	27 (5.6)	4 (2.2)	23 (7.6)
Retired	6 (1.2)	4 (2.2)	2 (0.7)
Unemployed	10 (2.8)	7 (3.9)	3 (1.0)
Has heard of HPV vaccines before	385 (79.9)	151 (83.4)	234 (77.7)
Familiar with HPV	107 (22.2)	42 (23.2)	65 (21.6)
Familiar with cervical cancer	312 (64.7)	113 (62.4)	199 (66.1)
Knows a child/teenager who has had HPV vaccination	94 (19.5)	28 (15.5)	66 (21.9)
Personal history of HPV vaccination	23 (4.8)	7 (3.9)	16 (5.3)
Personal history of HPV	12 (2.5)	5 (2.8)	7 (2.3)
Personal history of cervical cancer	5 (1.0)	2 (1.1)	3 (1.0)
Personal history of other cancer	15 (3.1)	4 (2.2)	11 (3.7)
Personal history of abnormal Pap smear test result	26 (5.4)	9 (5.0)	17 (5.7)
Daughter has had Pap smear test	8 (1.7)	1 (0.6)	7 (2.3)
Has concerns about daughter's risk of HPV	363 (75.3)	135 (74.6)	228 (75.8)
Has concerns about daughter's risk of cervical cancer	370 (76.8)	142 (78.5)	228 (75.8)
Believes daughter not at risk of HPV because not sexually active	466 (96.7)	175 (96.7)	291 (96.7)
Refused vaccine for daughter	32 (6.6)	7 (3.9)	25 (8.3)
Believes vaccines are somewhat unsafe or very unsafe	267 (55.4)	98 (54.0)	169 (56.2)
Believes either sex education or abstinence should be taught at school	466 (96.7)	174 (96.1)	292 (97.0)

Abbreviation: HPV= human papillomavirus

* Data are presented as No. (%) of respondents unless otherwise stated

that vaccines are somewhat unsafe or very unsafe, compared with only 9.8% of US mothers. This suggests that safety concern is the main barrier to vaccination uptake in Hong Kong. Education should

TABLE 2. Coefficients estimates for attribute main effects using multinomial logistic regression

Attribute	Preference weights	Standard error (95% confidence interval)	P value
Protection against cervical cancer	0.01633	0.0007514 (0.01486 to 0.0178)	<0.0001
Protection duration	0.01066	0.0005 (0.00968 to 0.01164)	<0.0001
Adverse effects	-0.07626	0.00487 (-0.0858 to -0.0667)	<0.0001
Out-of-pocket cost	-0.0003007	0.0000207 (-0.0003 to -0.0003)	<0.0001

TABLE 3. Willingness to pay for the attributes of human papillomavirus vaccination

Attributes	Marginal willingness to pay (HK\$)
Protection against cervical cancer, %	
0-100	5430.66
0-80	4344.53
0-70	3801.46
0-50	2715.33
Protection duration, y	
0 to lifetime	3545.06
0 to 10	354.51
0 to 5	177.25
0 to 2	70.90
Adverse effects, %	
14 to 0 in 100	3550.52
10 to 0 in 100	2536.08
6 to 0 in 100	1521.65
2 to 0 in 100	507.22
Maximum willingness to pay*	12 526.24
Willingness to pay for current vaccine†	1619.89

* Calculated by incorporating 100% protection, lifetime protection (100 years), and 0% risk of adverse effects

† By incorporating 70% protection against cervical cancer, 10-year protection duration, and 10% risk of adverse effects

focus on the safety of vaccines, and communication between mothers and providers on the benefits and risks of HPV vaccination should be encouraged as part of the health education programme. About 79.9% of mothers had heard of HPV vaccines, and the demand and perceived health benefits of HPV vaccines or risks of HPV were high, as indicated by the maximum WTP. This might reflect the fear of cancer and the efforts of health education and advertisement for cervical cancer prevention. Nonetheless, the overall WTP for current vaccines was lower than the market price for current vaccines. Subsidy or co-payment from the government should be considered to meet demand for HPV vaccination.

Our study has limitations. All decisions were made on hypothetical scenarios. Our choice sets considered a limited number of attributes from

the literature and a pilot study. Other attributes, especially for the protection against genital warts, may also reflect the preference. The sample was from two public hospitals; response bias from the convenience sampling method cannot be avoided, and the generalisability of the findings to entire Hong Kong population needs to be interpreted cautiously.

Conclusion

The perceived health benefits of HPV vaccines were high among Hong Kong mothers. They weighted concern about adverse effects as the most important attribute when considering HPV vaccination for their daughters. Their WTP was lower than the current market price of HPV vaccination and was diverse among different socio-economic groups.

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References

1. Choi HC, Leung GM, Woo PP, Jit M, Wu JT. Acceptability and uptake of female adolescent HPV vaccination in Hong Kong: a survey of mothers and adolescents. *Vaccine* 2013;32:78-84.
2. Li SL, Lau YL, Lam TH, Yip PS, Fan SY, Ip P. HPV vaccination in Hong Kong: uptake and reasons for non-vaccination amongst Chinese adolescent girls. *Vaccine* 2013;31:5785-8.
3. Brown DS, Johnson FR, Poulos C, Messonnier ML. Mothers' preferences and willingness to pay for vaccinating daughters against human papillomavirus. *Vaccine* 2010;28:1702-8.
4. Poulos C, Yang JC, Levin C, Van Minh H, Giang KB, Nguyen D. Mothers' preferences and willingness to pay for HPV vaccines in Vinh Long Province, Vietnam. *Soc Sci Med* 2011;73:226-34.
5. Ngorsuraches S, Nawanukool K, Petcharamanee K, Poopantakool U. Parents' preferences and willingness-to-pay for human papilloma virus vaccines in Thailand. *J Pharm Policy Pract* 2015;8:20.